

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
In Re Application of
Kazuhiro Sato et al.
Serial No. 10/031,616 Group: Art Unit 1773
Filed: 01/22/2002 Examiner: Jackson, Monique R
For: RESIN-COATED METAL PLATE, METAL CAN AND CAN CAP

DECLARATION UNDER RULE 132

I, Kazuhiro Sato, am a Japanese citizen residing at 4-1101-7, Matsumi-cho, Kanagawa-ku, Yokohama-shi, Kanagawa-ken, Japan, and declare that:

I, March, 1985, I graduated from Keio University, Faculty of Chemistry.

In April the same year, I was employed by Toyo Seikan Group, Corporate Research & Development (Yokohama, Japan) as a research chemist.

Since 1989, I have been engaged in the development of new resin-coated metals and, especially, polyester resin-coated metals.

I am one of the joint inventors of U.S. Serial No. 10/031,616, and am well versed in the contents of the invention described and claimed in the present application.

Recently, the Examiner has rejected the claims of the present application under 35 U.S.C. 103 as being unpatentable over JP 07-195617 in view of Nakamaki et al (USPN 6,071,599).

I have conducted the following additional experiment in order to demonstrate the fact that the blending amount of the tocopherol of 0.05 to 3% by weight, inherent viscosity of the polyester resin of 0.6 to 1.5, particular melting properties such as a melt viscosity of 2000 to 10000 poises of the resin coating layer, and a dispersion particle diameter of the ethylene polymer of not larger than 5 μ m of the present invention, are important for drawing properties of the coating layer comprising

the polyester resin, ethylene polymer and tocopherol to a maximum degree, and that satisfying the above properties enhances the film-forming property, adhesion, dent resistance, corrosion resistance and retort resistance, which are excellent effects never expected from JP 07-195617 or Nakamaki et al.

The Examiner alleges that Comparative Examples 7 and 8 described in the specification of the application are not enough for proving the above unexpected effects, and requests to show unexpected effects in relation to the amount of the tocopherol, melt viscosity and dispersion particle diameter.

Under such circumstances, I have conducted an additional experiment to prepare resin-coated metal sheets coated with resins while varying the amount of the tocopherol, melt viscosity and dispersion particle diameter, and to evaluate the resin-coated metal sheets concerning the evaluation items described in Examples of the specification of the application, i.e., concerning film-forming property, flat sheet dent ERV test, intimate adhesion, moldability into cans, packaging test and retort treatment test.

Described below are the details and results of the additional experiment.

Additional Experiment (Examples 22 to 23 and Comparative Examples 13 to 20)

(1) Preparation of resin-coated metal sheets.

A polyethylene terephthalate resin as polyester containing 0.5 mol% of an isophthalic acid component as a copolymerizable component, an ionomer (HIMILAN #1706) shown in Table 2 of the specification of the application as an ethylene polymer component, and a tocopherol (IRGANOX E201 produced by Chiba Specialty Chemicals Co.) were thrown resins forming the compositions shown in Table A below into a biaxial extruder in the same manner as in Example 18 of the specification of the

application, melt-kneaded, extruded through a T-die so as to assume a thickness of 30 μm , cooled through a cooling roll, and the thus formed film was taken up to obtain a cast film. The cast film was heat-laminated on both surfaces of the TFS steel plate (plate thickness of 0.18 mm, amount of metal chromium of 120 mg/m^2 , amount of chromium oxide hydrate of 15 mg/m^2) and was readily cooled with water to obtain a resin-coated metal sheet.

(2) Method of evaluation

The resin-coated metal sheets were evaluated for their flat sheet dent ERV test, adhesion, moldability into cans, package test and retort treatment test. The flat sheet dent ERV test, package test and retort test were further minutely evaluated on the following basis of evaluation.

* Flat sheet dent ERV testing

O: Average electric current $< 0.1 \text{ mA}$

Δ : $0.1 \text{ mA} \leq$ average electric current $< 0.5 \text{ mA}$

X: $0.5 \text{ mA} \leq$ average electric current

* Package testing

O: Corrosion was not observed at all

Δ : Corrosion was observed to a slight degree without, however, any problem in practice

X: Abnormal condition, i.e., corrosion was observed.

* Retort testing

O: Corrosion was not observed at all

Δ : Corrosion was observed to a slight degree without, however, any problem in practice

X: Abnormal condition, i.e., corrosion was observed.

(3) Results and Consideration

The results of the above measurements are shown in the following Table A.

As will be understood from the results described in Table A below, fully satisfactory results in all of the evaluation items were obtained by Examples 22 and 23 in which the amounts of the tocopherol, melt viscosities and dispersion particle diameters of the ethylene polymer were within the ranges of the present invention.

In Comparative Example 13, there was no practical problem. However, since the dispersion particle diameter of the ethylene polymer was not smaller than 5 μ m, the dent resistance, packaging test, and retort resistance were inferior to those of Examples 22 and 23. From these results, it was learned that the dispersion particle diameter (of not larger than 5 μ m) of the ethylene polymer has a critical meaning in the evaluation of the above properties.

In Comparative Examples 14 and 15 in which the melt viscosities and the dispersion particle diameters of the ethylene polymer were within the ranges of the present invention but without containing tocopherol and in Comparative Example 16 in which the tocopherol was contained in an amount in excess of the range of the present invention, the adhesion, packaging test and retort resistance were inferior, from which it was learned that the blending amount (0.05 to 3% by weight) of the tocopherol has a critical meaning in the evaluation of the above properties.

In Comparative Example 17 in which the amount of the tocopherol and the melt viscosity were within the ranges of the present invention but without being blended with the ethylene polymer, the dent resistance, adhesion, packaging test and retort resistance were inferior, from which it was learned that blending the ethylene polymer is essential.

In Comparative Example 18, the melt viscosity was smaller than the range of the present invention and tocopherol was not blended, either. In this case, the melt viscosity was so low

that the ethylene polymer was poorly dispersed and, besides, the dispersion particle diameter could not be decreased to be not larger than 6 μm . Accordingly, the results were inferior in all respects.

It was attempted to prepare a resin-coated metal sheet containing the tocopherol in an amount within the range of the present invention but having the melt viscosity smaller than that of the present invention like in Comparative Example 18 (Comparative Example 19). Like in Comparative Example 18, however, the melt viscosity was too low, and the ethylene polymer was poorly dispersed and the dispersion particle diameter could not be decreased to be not larger than 6 μm . Therefore, the results were evaluated to be unsatisfactory in all respects except the adhesion.

In Comparative Example 20, the dispersion particle diameter of the ethylene polymer and the amount of the tocopherol were within the ranges of the present invention. However, the melt viscosity was greater than the range of the present invention. In this case, the melt viscosity was so large that the torque of the extruder was exceeded, and the cast film could not be obtained.

From the results of the above additional experiment, it is obvious that the amount of the tocopherol, dispersion particle diameter of the ethylene polymer, and the melt viscosity of the coating layer all have critical meanings in producing the resin-coated metal sheet of the present invention satisfying all of film-forming property, adhesion of the film, dent resistance, corrosion resistance and retort resistance.

Table A

	Resin-coated metal sheet										Evaluation			
	Polyester			Ionomer		Tocopherol		Film-forming			Moldability		Package test	
	Amount (% by wt)	IV (dl/g)	Viscosity (poise)	Amount (% by wt)	Particle dia. (μ m)	Amount (% by wt)	Amount (% by wt)	property	dent	ERV (mA)	Adhesion	Object	Result	Corrosion
Ex.22	81.5	0.90	9000	18	0.5	0.5		O		O	O	can	O	O
Ex.23	81.5	0.69	4300	18	4	0.5		O		O	O	can	O	O
Comp.ex.13	81.5	0.69	4300	18	5.5	0.5		O		Δ	O	can	O	Δ
Comp.ex.14	82	0.69	4300	18	4	0		O		Δ	x	can	O	x
Comp.ex.15	82	0.90	9000	18	0.5	0		O		Δ	x	can	O	x
Comp.ex.16	78.5	0.90	9000	18	0.5	3.5		O		O	x	can	O	x
Comp.ex.17	99.5	0.90	9000	0	---	0.5		O		x	x	can	O	x
Comp.ex.18	82	0.55	1700	18	6	0		x		x	x	can	x	x
Comp.ex.19	81.5	0.55	1700	18	6	0.5		x		x	Δ	x	x	x
Comp.ex.20	81.5	1.50	15000	18	0.5	0.5		---		---	---	---	---	---

I, the undersigned Kazuhiro Sato, state that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both under Section 1001 of title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patents issuing therefrom.

Date: 2/9/2004

Kazuhiro Sato

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